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ABSTRACT

A study was conducted to determine whether children give evidence of using any of six comprehension strategies and whether children of same and different ages use different strategies. It was studied how comprehension performance can best be predicted by other facts about the child, including his language and his language input. The six comprehension strategies are: child as agent, probable event, animate noun as agent, relative object size, position bias, and word order. Of particular interest is whether the "animate agent" strategy can be shown to exist rather than the competing explanations of "relative object" size preference or, for some sentences, a judgment that the animate toy as agent is simply the more "probable event." Twenty-five children, eight aged 24-25 months, 10 aged 30-32 months, and seven aged 36-44 months, were studied in two to five 30-minute testing sessions in a small playroom with the mother present. Free speech samples for mother and child during free play, and the child's comprehension of the noun vocabulary to be used in a test with 24 toys were evaluated. The child's comprehension of 36 semantically reversible sentences was then tested by telling him "do what I say" and presenting the appropriate two toys as a sentence was spoken. The study did not find evidence for the "child as agent" strategy or the "relative object size" strategy. Word order strategies emerged as the first linguistic generalizations to be systematically applied across all the sentences of the study. (SW)

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COMPREHENSION STRATEGIES IN TWO AND THREE-YEAR-OLDS: ANIMATE AGENTS OR PROBABLE EVENTS?

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English-speaking children are typically 3 1/2 to 5 years old before they consistently use word order as a cue to meaning in active, semantically reversible sentences such as The boy washes the girl and The girl washes the boy (Fraser, Bellugi, and Brown, 1963; Carrow, 1968; Owings, 1972; de Villiers and de Villiers, 1973; Strohner and Nelson, 1974; Chapman and Miller, 1975).

One question raised by this finding is that of how English-speaking children understand simple sentences prior to their use of word order cues. In ordinary conversation, ongoing activity may make agent and object-of-action clear for much of what is said. Such context is not available, however, in experimental comprehension tasks. Group performances on these experimental tasks suggest the existence of the following response preferences:

1) Child as agent (Sinclair and Bronckart, 1972; de Villiers and de Villiers, 1973), in which the child himself acts on one or both objects in the way mentioned. This response is frequent among children in Brown's (1973) early Stage I.

2) Probable event (Bever, 1970; Strohner and Nelson, 1974), in which the more probable agent and object relation is preferred.

3) Animate noun as agent (Chapman and Miller, 1975), in which the animate noun in the sentence is more often acted out as the agent than the inanimate noun.

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4) Relative object size, in which a preferred size determines the toy used as agent. This bias was an alternative explanation to the animate agent preference in the Chapman and Miller (1975) study, since the smaller toy was always the animate one.

5) Position bias, in which the picture or object in a preferred position is chosen. This factor has traditionally been one for control.

6) Word order, in which the first noun mentioned in a sentence is preferred as agent (Bever, 1970). At about the same time, group performance on reversible passives drops below chance, suggesting an over-extension of a word order - based preference to passives (Bever, 1970; Owings, 1972; de Villiers and de Villiers, 1973; Maratsos, 1974; Beilin, 1975; Horgan, 1975; Maratsos and Abramovitch, 1975).

One can call these preferences comprehension strategies if individual children show them consistently (for example, at least 80% of the time) in

a sentence interpretation task (Clark, 1975; Chapman, 1977). In this study, we ask whether individual children give evidence of using any of the six comprehension strategies; whether children of different ages use different strategies; whether children of the same age use different strategies; and how comprehension performance can best be predicted by other facts about the child, his language, and his language input.

Of particular interest is whether the animate agent strategy suggested by the Chapman and Miller (1975) study can be shown to exist, rather than the competing explanations of relative object size preference or, for some sentences, a judgment that the animate toy as agent is simply the more probable event. If it can be shown that children are using a general semantic rule of animate agent then their apparent ability to understand novel sentences in everyday speech becomes easier to understand (Limber, 1976, shows that in both child and adult speech, sentence subjects are typically animate, objects typically inanimate.) The existence of an animate agent strategy would suggest the existence of other strategies based on semantic characteristics of the child's speech, or speech to the child.

METHOD

Subjects. Twenty-five Madison, Wisconsin children participated in the study, 8 aged 24 or 25 months, 10 aged 30 to 32 months, and 7 aged 36 to 44 months. There were 5 children showing mean lengths of utterance (MLU) in morphemes falling with each of 5 MLU ranges: Brown's (1973) early Stage I (1.1 to 1.5 MLU); late Stage I (1.5 to 2.0 MLU); Stage II (2.0 to 2.5 MLU); Stage III (2.5 to 3.0 MLU); and early Stage IV (3.0 to 3.5 MLU).

Testing Procedures. Two to five 30-minute testing sessions were held for each child in a small playroom; the mother was always present. Twelve-minute free speech samples for mother and child were obtained during their free play together in the first session. Transcriptions were scored for MLU by Brown's (1973) procedures as modified by Chapman and Miller (1975). Total number of M and C utterances, the ratio (M - C)/(M + C), and the proportion of the mother's utterances mentioning people or objects not present in the room were computed. Five minutes of the child's play was observed and scored for the presence or absence of symbolic play (Lezine's Stage 4C, evocation of a missing object or symbolic substitution of one object for another, 1973). The child's short-term memory span (STM) for random strings of high frequency monosyllabic nouns presented at a 1 per second rate was assessed (Calfee, Chapman, and Venezky, 1972).

In the second session, prior to the sentence comprehension testing, the child's comprehension of the noun vocabulary to be used was assessed with all 24 toys to be used; all children passed this test for all nouns and toys. Verb comprehension was also tested by placing two objects in front of the child and saying, e.g., "Show me 'hits'." Up to 10 models of an unambiguous demonstration of the verb were given if the child could not act out the verb or did so ambiguously with respect to agent and object of action (only chase and carry ever required training). All children retained in the study correctly demonstrated the six verbs appropriately and unambiguously after training, if not before. (Two children were excluded for this reason).

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Following the vocabulary testing of the second session, the child's comprehension of 36 semantically reversible sentences was tested by telling him "Do what I say" and presenting the appropriate two toys as a sentence was spoken. The 36 stimuli consisted of three separate presentations of each of 12 sentences, with relative toy size (animate toy larger, smaller, or same as inanimate) varying each time. The 12 sentences consisted of six simple sentences containing animate subject and inanimate object (e.g. The kitty pushes the door) and their reversals (The door pushes the kitty). The events described varied in presumed probability of the animate noun as agent (see Table 1). Half the children were tested with one set of toys and half with another. Left-right position of the subject toy was alternated; order of trials independently randomized for each child.

Responses to the comprehension task were scored as correct (appropriate action in correct agent-object roles); reversed (appropriate action in reversed roles); child-as-agent (child carries out appropriate action on one or both toys with himself as agent); conventional use (conventional but not appropriate action with one or both toys); ambiguous (appropriate action but roles ambiguous); no response; or other.

RESULTS AND DISCUSSION

Only correct and reversed responses occurred frequently; the number of correct responses increased both by age group and by MLU. Only 5 child-as-agent responses occurred; conventional use and other responses were frequent only in the two-year-olds. Correlations of child age, child MLU, child STM, number of child utterances, mother's MLU and proportion of mother's utterances about absent objects with number correct were all significant ($p < .01$, $r > .505$, $df = 23$), varying in magnitude from .51 to .91. Partial correlations of each of the latter six variables and number correct, with age partialed out, were not significant. The partial correlation of age and number correct remained significant when any one of the other six variables was partialed out ($p < .01$ for the corresponding Z values), varying in magnitude from .77 to .88. Thus age alone accounted for much of the variability in comprehension scores in this study.

Evidence for Developmentally Changing Comprehension Strategies in Individual Children

Probable Event or Animate Agent? Individual children's consistent (5/6 or better) response preferences are summarized in Table 1. Child-as-agent was omitted because no child showed these preferences consistently on a sentence pair. Relative object size is omitted because it produced no significant effects or interaction in an anova not reported here.

These preferences constitute evidence, from the children's point-of-view that certain event sequences were more probable: Kitty pushing door is the preferred interpretation for 14 of the 18 children in the two younger

Table 1

Number of Children in Each Group Whose Responses to the Presentations of a Sentence and Its Reverse Match Strategy 5 out of 6 or Better[a]

Strategy	Age Group	REVERSIBLE SENTENCE ELEMENTS FOR SENTENCE PAIR						Total Matches	Matches Predicted by Chance Alone
		Kitty push door	girl bump swing	baby move ball	boy hit truck	horse carry boat	dog chase car		
Probable Event: Animate-as-Agent	2(n=8)	7	2	0	1	0	0	10*	5.3
	2 1/2(n=10)	7	5	1	3	4	0	20*	6.6
	3 1/3(n=7)	0	0	0	0	0	0	0**	4.6
	All(n=25)	14	7	1	4	4	0	30*	16.5
Probable Event: Inanimate-as-Instrument	2	0	0	1	1	2	0	4	5.3
	2 1/2	1	0	2	1	2	0	6	6.6
	3 1/2	0	0	0	0	0	0	0**	4.6
	All	1	0	3	2	4	0	10**	16.5
Word Order	2	0	0	0	1	0	0	1**	5.3
	2 1/2	1	1	3	2	1	1	9*	6.6
	3 1/2	6	6	6	6	5	4	33*	4.6
	All	7	7	8	9	6	5	43*	16.5
Position of Toy	2	0	1	1	0	1	1	4**	10.6
	2 1/2	4	4	6	5	0	2	21*	13.2
	3 1/2	0	0	0	0	0	0	0**	9.2
	All	4	5	7	5	1	3	25*	16.5
No Strategy Match	2	1	5	7	4	5	8	30*	26.9
	2 1/2	0	1	0	2	3	7	13**	33.6
	3 1/2	0	0	0	0	2	3	5**	23.5
	All	1	6	6	4	6	17	48**	84.0

[a]These predictions are made on the basis of the binomial theorem by assuming, conservatively, that the probability of demonstrating a sentence correctly on a single trial is .5. The probability of matching a strategy 5/6 or better is .11.

*More matches than predicted by chance alone.

**Fewer matches than predicted by chance alone.

groups; girl bumping swing for 7 of the 18 children in the two younger groups. The frequency of these response preferences can be compared to the number of matches expected by chance alone, when the probability of a single response matching the described one is taken, conservatively, as .5 and the binomial theorem is used. Responses to each set of six sentences which match that predicted by the strategy 5 out of 6 times or better would arise, by chance, with a probability of .11 for each child. The number of apparent matches which would arise by chance alone is also indicated in Table I.

Consistent interpretations in which the animate toy serves as agent occur more often than predicted by chance for two of the sentences in the two-year-old group and four of the sentences in the two-and-a-half year old group. In contrast, response patterns in which inanimate objects serve as the agent of action occur no more often than chance matching rates overall. This finding means that children often regard animate nouns as the more probable agent; but that their preference could be viewed as a special instance of a probable event strategy rather than a general animacy strategy applied equally across sentences.

Word Order. The developmental change in ability to understand agent-object relations on the basis of word order cues can also be seen in Table I. Three-and-a-half year olds consistently (5/6 or better) use a word order strategy for the six presentations of a sentence and its reversal. Only two more word order matches than expected by chance alone arise for two-and-a-half year olds; and fewer than expected for two-year-olds.

Toy Position. A fourth basis for response choice existed in the present study, although it was counterbalanced: that of position bias, or choosing to use as agent or instrument the toy in a given position, usually the toy nearest the right hand. Children's response patterns matching a left or right-hand position bias 5 out of 6 times or better are also summarized in Table I. It can be seen that these patterns are more frequent than one would expect by chance alone for the two-and-a-half year olds. The youngest group, in contrast, includes many more children who give no evidence of a systematic response strategy for a set of sentence pairs.

Failure to respond systematically is also sometimes associated with sentence set. There were many more cases in which no response strategy was used for the sentence "The dog chases the car" and its reversal than for other sentence sets. This may be attributed in part to the large number of ambiguous responses (dog and car moving side-by-side) made on this verb; "chase" accounts for 26 of the 44 ambiguous responses recorded.

Does a Child Always Use the Same Strategy?

Given that children two-and-a-half and older show consistent response patterns to most sentence sets, it can be asked whether an individual child employs the same strategy on each sentence set to which he responds consistently. The answer is no, not always. Since the probability of one match is .11, the probability of two matches to the same strategy by chance alone ($p < .02$) can be regarded as negligible. If the number of different

strategies which a child uses at least twice is computed, only half the two-year-olds use even one strategy more often than chance by this criterion, whereas all the children two-and-a-half or older use at least one. For two-and-a-half-year-olds, just under half the children show at least two strategies: probable event and word order, probable event and position, or word order and position. The oldest group consistently show only word order strategies.

A Possible Explanation for Two-Year-Old Performance: Limited Probable Event Strategies

Evidence for two strategies was not obtained in this study: the child as agent strategy which de Villiers and de Villiers (1973) report; and the relative object size strategy which was an alternative explanation of Chapman and Miller's (1975) findings. The failure to obtain child as agent responses most probably stems from the verb pretraining procedures used here and in the Chapman and Miller (1975) study, in which the child is explicitly shown how to act on one object with another. Apparently, the child learned to respond by making one object act on another, rather than by acting on either himself. Many of the conventional use and other responses recorded for early Stage I children resulted from the demonstration of some interaction between the objects (e.g., putting the girl in the swing or the baby on the ball) that was not the action requested but was probable for the particular objects.

It may be the case that both the conventional use and other responses in this study and child as agent strategies in other studies arise as task solutions when the child is not yet able to process all three major lexical items in the sentence. They are variants of a probable event do-what-you-usually do strategy, where variation is determined by which lexical items are remembered, which actions are suggested by the objects, and which actions are prescribed by the experimenter. Smith (1972) and Larson (1974) have demonstrated that children in early linguistic Stage I perform well on tasks requiring the comprehension of two major lexical items, but not on those requiring comprehension of three. Late Stage I children show comprehension for three elements. The decrease of other responses in this study, and of child as agent responses in the de Villiers' study (1973), after early Stage I is consistent with this interpretation.

Implications of the Failure to Find an Animate Agent Strategy

The failure to confirm a general semantic strategy of animate noun as agent is revealing, in that word order strategies emerge as the first linguistic generalizations to be systematically applied across all the sentences of the study. The earlier strategies, we may argue, arise from systematic ways for responding based on some lexical understanding, past experience and contextual information. The two-and-a-half-year olds generalizations are about the usual state of the world, rather than the

usual state of sentences. Comprehension performance is consistent with what is known rather than what is said.

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